

En Route Severe Weather

EW-1 Provide Better Hazardous Weather Data



The disruptions caused by hazardous en route weather are magnified by the uncertainty in the location, movement, and severity of the weather conditions. Forecast accuracy is not well suited to the strategic planning of traffic flow decisions. Joint planning is further hindered by limitations in real-time data sharing capabilities. Operational decision making by airlines and traffic flow managers will be improved based on common awareness of the situation, coupled with the improved data exchange, training, and coordination processes which are being applied to the overall en route congestion problem.

Key Dates

Improvements to FEA/FCA	2002
Decision on Need for Additional Weather Sensors and Radar Facilities	2002
Deploy On-DSR Weather Display	2003
Deployment of Improved Systems for Common Situational Awareness	2003
Deploy Additional CRCT/FCA Capabilities	2003

EW-1 Solution Set

EW-1.1 Improved Weather Reporting and Forecasting

Key Risks

- Funding of AWRP programs.
- Community roadblocks to radar or sensor installations.

- Operational implementation and significance of the anticipated improvements in TFM as a result of improvements made to convective weather forecasts.
- Speed of the research and development of weather sciences.
- National Weather Service cost/benefit analysis for producing additional aviation weather products and systems.
- A satisfactory assessment by the three organizations responsible for weather product evaluation: the AWTT Board; the CDM-CR Committee; and Lincoln Laboratory, including follow-up for operational implementation.
- Cost/benefit analysis for outfitting aircraft with additional weather sensing equipment.

EW-1.2 Dissemination of Common Weather Information

Key Risks

- Speed of improvements in the state-of-the-art of weather science.

EW-1.3 More Precise Identification of Flights to be Impacted by Severe Weather

Key Risks

- Speed of the research and development of weather sciences.

EW-1.4 Display Detailed Weather to Controllers

Key Risks

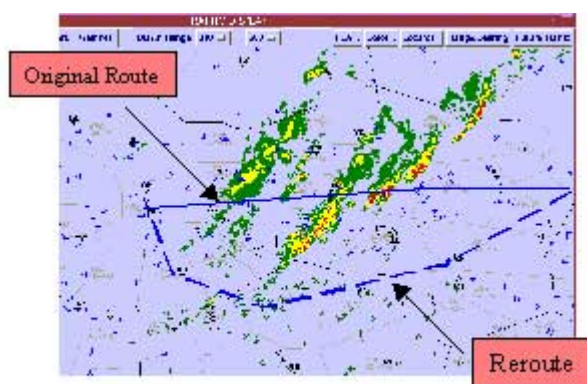
- Agreement on roles, responsibilities, and accountability issues.
- Deployment of required interfaces (e.g., WARP/DSR) is complex process and may induce schedule delays and additional requirements (e.g., security).

Air Traffic Services / TM-Strategic Flow / Flight Day Management

[105201](#) - Current Flight Day Management

[105204](#) - Collaborative Rerouting (CRCT Demonstration)

EW-2 Respond Effectively to Hazardous Weather



En Route

Managing the routes of aircraft, and particularly adjusting routes quickly to avoid hazardous weather conditions without disruptions to traffic flows, is difficult in today's environment. This leads to inefficient use of available airspace and unnecessary congestion and delays. Some sources of the difficulty are: rigid airspace and route structures; incompatibilities among automation systems used by airlines, aircraft flight management systems, and air traffic management; and cumbersome processes for modifying flight plans and communicating the changes quickly. Operationally, the solution involves improved weather prediction and forecast distribution, more flexibility in routing, faster identification of airspace and flights impacted by weather, common availability of current information among all participants in the planning process, and procedures and training to support the collaborative adjustment of routes to ensure safety while maintaining traffic flows. A program of training for controllers, pilots, and airline dispatchers has been instituted to prepare for the severe weather season of spring/summer 2001. Annual reviews of what works and what needs to be adjusted in the collaborative process will lead to continuing refinements each year.

Key Dates

Operational Rules and Process Changes (Annual Cycle) 2002

Train Personnel and Implement Recommendations (Annual Cycle) 2002

EW-2 Solution Set

Timely identification of en route impacts, improved route predictability, and improved route flexibility through alternative route options.

Background

Today's route management remains relatively inflexible due to rigid airspace design, continued use of ground based Nav aids, and incompatible databases and automation systems between users flight plan systems, FAA HOST requirements, and aircraft navigation systems. Flight plan route changes are workload intensive for all stakeholders resulting in increased flight delays, and cancellations. Advanced aircraft navigation systems have remained largely unused due to an inflexible airspace structure. Poor communication of route and airspace status continues to plague the system resulting in inefficient use of available resources. Additionally, the inability to communicate flight plan changes quickly and in bulk for major traffic flows also slows the process.

Ops Change Description

Operationally, route management will become a simplified task for all stakeholders. Common identification of impacted airspace utilizing tools such as the Collaborative Convective Forecast Product (CCFP) and the Traffic Situation Display (TSD) functions such as the Flow Evaluation Area (FEA)/Flow Constraint Area (FCA) will aid in applying solutions. The common situational awareness created through shared information will allow system users to identify their own solutions. Activating alternative route options utilizing the National Playbook or Coded Departure Routes ensure a quick implementation of a solution. The development of alternative routes including area navigation (RNAV), low altitude routes, and use of available military airspace will make airspace available during situations where normal routes are congested or impassable due to weather conditions.

Route management should be a collaborative effort between the FAA and users to ensure safety of flight (relative to fuel, hazardous weather, etc.) as well as to ensure that traffic volume and complexity concerns are considered to ensure safe separation of aircraft from aircraft.

Benefit, Performance and Metrics [suggested data sources]

- Improved predictability in delay, cancellation, and en-route time calculations [Aviation System Performance Metrics (ASPM)]
- Increase on-time departure and arrival goals. [Department of Transportation statistics, ASPM]
- Reduction of Mile In Trail due to efficient use of available airspace resources. [ATCSCC logs]
- Decrease in block times [ASPM]
- Reduction in variance of execution against plan. [POET]
- Reduce fuel consumption due to extended rerouting options which maximize throughput in area closest to the Users Preferred Trajectory (UPT) [airlines flight plan data, POET]
- Reduction in flight diversions due to extensive re-route only options. [ATCSCC diversion data]

Scope and Applicability

The roles and responsibilities for route management were a key element in the S2K +1 field-training package. The coordination efforts of the past year along with expanded options and additional airspace for conducting rerouting enhanced the ability to respond to hazardous weather. The community's plan for the 2002 severe weather season builds on these successes.

Near-Term:

- Collaboration for identifying airspace constraints, and routing solutions utilizing DSS tools such as the Flow Evaluation Area (FEA)/Flow Constraint Area (FCA) functions of the TSD and the user access through the Common Constraint Situation Display (CCSD).
 - Integrated testing of proposed FEA/FCA procedures 8/01.
 - CCSD/FCA human in the loop testing complete 11/01
 - FCA procedures and training of the Severe weather unit is planned in 2002
- S2K +1 strategic planning process,
 - A variety of information including route status, playbook initiatives, advisory sequences and task assignments were tracked and coordinated using the electronic whiteboard.
 - In 2002 a standardized format for use of the electronic whiteboard in coordinating and communicating the strategy will be developed.
- Efficient access to Canadian and Military airspace.
 - Letter of Agreements and procedures implemented for more efficient access to military airspace (5/01).
 - Agreement with NavCanada concluded to allow greater access to Canadian airspace (Spring 2001).
 - Four additional RNAV routes are under development with NAV Canada.
- Playbook:

Continued use and development of the Playbook for expanded options.

 - FAA Notice 7210.517, National Playbook (effective 12/18/01), establishes the procedures, responsibilities, process, and cycle for the National Playbook. The process follows the standard 56-day publication cycle.
 - Updates and enhancements are published on the standard 56-day cycle.
 - A total of 126 plays are included in the National Playbook (11/01).
 - The Playbook will be incorporated in ETMS version 7.4 (3/02)
- RMT/CDR:

Coded Departure Routes (CDRs) provide options for departure that are pre-coordinated and pre-defined so that user and FAA systems can accept them with little or no modification.

- FAA Notice 7210.507, Coded Departure Routes (effective 6/15/01), establishes procedures, responsibilities, process, and cycle.
- The process follows the standard 56-day publication cycle.
- More than 13,000 CDR's are available for use (12/01).
- Altitude Options:

The Low Altitude Arrival and Departure Routing (LAADR) program provides options for use of low altitude routes in situations where their normal routes at higher altitudes are unavailable.

 - Dynamic use of altitude CAPing
 - LAADR agreement established between ZMP and NWA (5/01)
- Define local procedures for route management in the terminal domains utilizing tools such as Traffic Management Advisor (TMA).
 - Handbook changes have been developed with anticipated February 2002 effective date.
- Reroute communication methods:

Establish system wide procedures for coordinating and communicating re-route strategies both in the strategic and tactical environments. Use of the Traffic Management National Log for internal ATS communication, machine-readable ATCSCC advisory formatting for system wide dissemination, and additions to the ATCSCC web site (e.g., the diversion recovery page), will enhance all communication.

 - TMNL deployed at 7 beta sites (9/5/01).
 - TMNL Version 1.22, Enhancements to the viability of the restriction process (scheduled 2/02)
 - TMNL expansion to most ARTCC's planned for Spring 2002
 - Collaborative Decision-Making (CDM), Collaborative routing (CR), Reroute Advisory Team (RAT) has been established to identify requirements for machine-readable advisories. Human in the loop testing conducted July-October 2001. Product was enhanced based on recommendations of the group.
 - Phase I implementation scheduled for 3/02.
 - Phase II implementation scheduled for 10/02.
- Additional use of area navigation (RNAV) for departures, en-route and arrival routes.
 - Handbook changes are in development, anticipated to be effective in August 2002.

- In 2002 the Severe Weather unit will work on a consistent process for conveying MIT associated with weather reroutes

Mid- to Long- Term:

- Use of U.S. domestic reduced vertical separation minima (RVSM) to reduce the need for reroutes where projected congestion is the cause.
 - Possible limited tactical use 7/03
 - National implementation planned for 12/04
- Improved communication of route status.
 - CRCT functionality
 - Initial routing functions
 - Show “entering flights” counts in bar chart and timeline
 - Time-in-FCA display
 - Include FCA in TSD replay
- Enhanced automation for re-route solutions
 - URET for ARTCC areas and controllers
 - TSD FEA/FCA capabilities for TMU’s.

Key Decisions

- Aircraft performance efficiencies and cost of using low altitude routes
- Cost/benefit analysis for aircraft equipage for RVSM implementation.
- Compatibility and integration of automation systems between NAS users and FAA HOST.
- How to hold users accountable for "not" allowing aircraft access to the system when needed. For example, aircraft are allowed to depart even when it is known they can't land, and then delays are counted as weather or ATC.
- Pursue local MOU's for LAADR usage.
- The Tactical Altitude Assignment Program (TAAP) is part of the National Airspace Redesign Choke Points activities.
The community completed the TAAP trials with the result that TAAP at a national level was discontinued 06/01.
- In 2002, we will evaluate the effectiveness of CIWS as a tool for evaluating a centers request to open or close an airway for weather.

Key Risks

- Limited availability of airspace in high volume situations that often occur in the northeast during severe weather.

- ## EW-2 Decision Tree



Support Offices

OEP Version 4.0 (6 December 2001)

EW-2 Links To Architecture

Air Traffic Services / TM-Strategic Flow / Flight Day Management

[105201](#) - Current Flight Day Management

[105204](#) - Collaborative Rerouting (CRCT Demonstration)

Air Traffic Services / Airspace Management / Airspace Design

[108101](#) - Current Airspace Design